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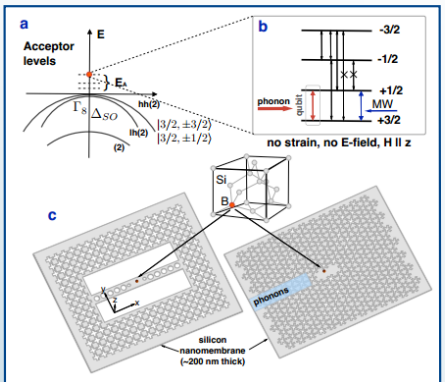
S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles



(a) Hole valence bands in Si; (b) Ground state splitting via external magnetic field along [0;0;1] direction; (c) Examples of nanomechanical 1D and 2D phonon bandgap cavities

Physicists have designed the building blocks of quantum computer that works using sound

Next Big Future, 14AUG2012

Researchers in the US show how long-lived and tunable acceptor (hole) impurity states in silicon nanomechanical cavities can play the role of a matter non-linearity for coherent phonons just as, for example, the Josephson qubit plays in circuit-QED. This system enables the control of single phonons and phonon-phonon interactions, dispersive phonon readout of the acceptor qubit, and compatibility with other nano/optomechanical components such as phonon-photon translators. TECHNICAL ARTICLE

Tags: Quantum science, Featured Article

Optics and photonics research priorities, grand challenges presented in new report

National Academies, 13AUG2012

A new report from the National Research Council identifies research priorities and grand challenges to fill gaps in optics and photonics, a field that has the potential to advance the economy of the United States and provide visionary directions for future technology applications. The report recommends that the federal government develop a "National Photonics Initiative" to bring together academia, industry, and government to steer federal research and development funding and activities. REPORT

Tags: S&T policy, NSF, Featured Article

Space-time symmetry renders optical systems invisible

Nanowerk, 13AUG2012

Scientists in Germany have recently discovered that light propogation can be influenced substantially by adjusting amplification and loss. They have succeeded in transferring the principle of maintaining the parity-time symmetry (PT) to optics and are applying the principle to light pulses in large optical networks. Experiments have shown that in loop mirrors with controlled periodical amplification and loss, light travels in a fundamentally different way than in conventional materials. The strength of optical fields can change drastically- in certain parameter ranges, the flanks of light pulses travel beyond the speed of light. TECHNICAL ARTICLE

Tags: Breakthrough technology, Materials science, Featured Article

S&T News Articles

ADVANCED MATERIALS

Nanotechnology breakthrough boosts data security

Nanowerk, 15AUG2012

Researchers in Taiwan have developed a unique approach to aiming a laser beam that will enable increased data storage capacity as well as the ability to encrypt information on DVDs coated with gold nanorods. TECHNICAL ARTICLE

Tags: Advanced materials, Information technology

Physicists Explore Properties of Electrons in Revolutionary Material

Science Newsline, 14AUG2012

Scientists from Georgia State University and the Georgia Institute of Technology have found a new way to examine certain properties of electrons in graphene. When you shine microwaves on the device it absorbs the microwave energy, and that changes the resistance of the device. Measuring spin resonance electrically is especially useful for nanoscale devices.

Tags: Advanced materials

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Physics team devises a way to make first undoped silicon nanowire gate

PhysOrg.com, 14AUG2012

A team of French physicists has found a way to create logic gates, transistors and diodes from silicon nanowires without having to resort to dopants . Their process involves applying a very thin layer of silicates at the juncture of metal and nanowires.

Tags: Advanced materials, S&T France

Wireless power for the price of a penny?

Science Daily, 14AUG2012

For a price of just one penny per unit the device, known as a rectenna (a combination of an antenna and a rectifier), can be placed onto objects such as price tags, logos and signage so that we can read product information on our smartphones with one simple swipe. It could change the way we interact with everyday objects.

Tags: Advanced materials

Graphene's behavior depends on where it sits

MIT News, 13AUG2012

When sheets of graphene are placed on substrates made of different materials, fundamental properties—such as how the graphene conducts electricity and how it interacts chemically with other materials—can be drastically different, depending on the nature of the underlying material. TECHNICAL ARTICLE

Tags: Advanced materials

New bacteria resistant materials discovered

Alpha Galileo Foundation, 13AUG2012

Scientists at the University of Nottingham have discovered a new class of polymers that are resistant to bacterial attachment. These new materials could lead to a significant reduction in hospital infections and medical device failures.

Tags: Advanced materials, Materials science

Materials for Emerging Energy Technologies: what will the future hold?

EUROPA research, 10AUG2012

In 2011, European Commission held a workshop on "Forward Looking on Materials for Emerging Energy Technologies". The aim of the workshop was to identify research and development of new materials to support emerging low carbon energy technologies for market deployment by 2050. REPORT, RELATED DOCUMENT

Tags: Advanced materials, S&T EU, S&T Policy

Graphene coating transforms fragile aerogels into superelastic materials

PhysOrg.com, 09AUG2012

Researchers at Carnegie Mellon University worked with CNT aerogels, which (in addition to the air) are made of dispersed nanotubes about 1 micrometer long. CNT aerogels hold their shape due to molecular interactions at the nodes, the points where the nanotubes cross each other. However, when these aerogels are compressed by up to 90 percent of their original size, they collapse or become permanently deformed, limiting potential applications. TECHNICAL ARTICLE

Tags: Advanced materials, CNT

Making graphene 'bread' - leavening technique results in freestanding graphene oxide films

Nanowerk Spotlight, 09AUG2012

To scale up the production of graphene, a novel approach uses a simple leavening strategy to prepare reduced graphene oxide (rGO) foams with porous and continuous cross-linked structures from freestanding compact graphene oxide layered films. The whole process is more like making graphene "bread". The rGO foams perform excellently as flexible electrode materials for supercapacitors and selective organic absorbents.

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Autonomous robotic plane flies indoors (w/video)

MIT News, 13AUG2012

The MIT researchers have completed a series of flight tests in which an autonomous robotic plane running their state-estimation algorithm successfully threaded its way among pillars in the parking garage under MIT's Stata Center. The next step will be to develop algorithms that can build a map of the plane's environment on the fly. VIDEO

Tags: Autonomous systems & robotics

Soft autonomous robot inches along like an earthworm

MIT News, 13AUG2012

Researchers at MIT, Harvard University and Seoul National University have engineered a soft autonomous robot that moves via peristalsis, crawling across surfaces by contracting segments of its body, much like an earthworm. The robot, made almost entirely of soft materials, is remarkably resilient: even when stepped upon or bludgeoned with a hammer, the robot is able to inch away, unscathed. VIDEO

Tags: Autonomous systems & robotics

Video Friday: Scary UAVs, Friendly Exoskeletons, and Cheetah Gets a Tail

IEEE Spectrum, 10AUG2012

Ekso Bionics has introduced a new version of its rehab exoskeletion, featuring several new walking modes and a wireless sensing system.

Tags: Autonomous systems & robotics

UAV flies on laser light

IEEE Spectrum, 08AUG2012

Lockheed Martin and its Seattle-based partner, LaserMotive, announced that they have successfully powered an

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"The greatest enemy of knowledge is not ignorance, it is the illusion of knowledge."
STEPHEN HAWKING

unmanned aerial vehicle, Lockheed's Stalker, with laser light. It was the first outdoor test of a system that's meant to keep an electric UAV aloft far longer than its batteries alone could manage.
Tags: Autonomous systems & robotics

BREAKTHROUGH TECHNOLOGY

New York to London in an hour: Hypersonic WaveRider aircraft to be tested Tuesday

Digital Trends, 13AUG2012
Taking off from Edwards Air Force Base in California's Mojave Desert, the plan is to carry WaveRider—a hypersonic aircraft developed by the US Air Force, Boeing, and Pratt and Whitney, and financed by NASA and the Pentagon—on the wing of a B-52 plane over the Pacific Ocean to a height of 50,000 feet. It'll then detach from the B-52 and embark on a five-minute flight at speeds of up to 4,500 mph. VIDEO
Tags: Breakthrough technology, Government S&T

COMMUNICATIONS TECHNOLOGY

Emergency communications technology progresses to field test

R&D Magazine, 09AUG2012
iDAWG (Intelligent Deployable Augmented Wireless Gateway), works with a new type of software application, called edgeware. The edgeware application to be tested is called "Gridstream X." Through WiGiT-developed cognitive radio interfaces and the abilities of the "Gridstream X" software, iDAWG is intended to integrate with FEMA's Integrated Public Alert and Warning System (IPAWS). IPAWS is the communication system used by most police and fire agencies and emergency management responders.
Tags: Communications Technology

Seeing the light with NIST's new noiseless optical amplifier

PhysOrg.com, 09AUG2012
Scientists working at the National Institute of Standards and Technology have demonstrated that they can amplify weak light signals without adding noise while also carrying more information, "more pixels" than other low-noise amplifiers. The new development could improve optical communications, quantum computing and information processing, and enhance biological and astronomical imaging.
Tags: Communications Technology

COUNTER WMD

New substances 15,000 times more effective in destroying chemical warfare agents

Science Daily, 08AUG2012
Researchers at the University of Texas explain that a soil bacterium makes a protein called phosphotriesterase (PTE), which is an enzyme that detoxifies some pesticides and chemical warfare agents like sarin and tabun. PTE thus has potential uses in protecting soldiers and others. Natural PTE, however, works against only one of the two molecular forms of these chemical warfare agents, and it happens to be the less toxic form. The scientists thus set out to develop new versions of PTE that were more effective against the most toxic form. TECHNICAL ARTICLE
Tags: Counter WMD

CYBER SECURITY

Security risk: Sensitive data can be harvested from a PC even if it is in standby mode, experts say

Science Daily, 13AUG2012
Researchers in Greece have shown that data held in RAM is not lost if the computer is switched off but the main electricity supply not interrupted. They suggest that forensics experts and criminals might thus be able to access data from the most recently used applications. They point out that starting a new memory-intensive application will overwrite data in RAM while a computer is being used, but simply powering off the machine leaves users vulnerable in terms of security and privacy.
Tags: Cyber security

ENERGY

A new energy source: Major advance made in generating electricity from wastewater

e! Science News, 14AUG2012
Engineers at Oregon State University have made a breakthrough in the performance of microbial fuel cells that can produce electricity directly from wastewater, opening the door to a future in which waste treatment plants not only will power themselves, but will sell excess electricity.
Tags: Energy

IMAGING TECHNOLOGY

Colour printing reaches its ultimate resolution

Nature News, 13AUG2012
The highest possible resolution images—about 100,000 dots per inch—have been achieved, and in full-color, with a printing method that uses tiny pillars a few tens of

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nanometres tall. The method could be used to print tiny watermarks or secret messages for security purposes, and to make high-density data-storage discs. TECHNICAL ARTICLE

Tags: Imaging technology

Featured Resource

TED

TED is a nonprofit devoted to Ideas Worth Spreading. It started out in 1984 as a conference bringing together people from three worlds: Technology, Entertainment, Design. Since then its scope has become ever broader. TED includes the TEDTalks video site, the Open Translation Project and more. RSS

INFORMATION TECHNOLOGY

Math algorithm tracks crime, rumours, epidemics to source

PhysOrg.com, 14AUG2012

A team of scientists in Switzerland has developed an algorithm that can identify the source of an epidemic or information circulating within a network, a method that could also be used to help with criminal investigations. By looking at the messages received by just 15 of your friends, and taking into account the time factor, the algorithm can trace the path of that information back and find the source. TECHNICAL ARTICLE

Tags: Information Technology, S&T Switzerland

Tracking Down an Epidemic's Source - Focus

American Physical Society Spotlight, 10AUG2012

A team of scientists at MIT have developed a technique based on the principles used by telecommunication towers to pinpoint cell phone users, and they demonstrate its effectiveness with real data from a South African cholera outbreak. The system could also work with other kinds of networks to help governments locate contamination sources in water systems or find the leaders in a network of terrorist contacts. TECHNICAL ARTICLE

Tags: Information Technology, Mathematics

MATERIALS SCIENCE

A Fuller Picture of the Higgs Boson - Viewpoint

American Physical Society Spotlight, 14AUG2012

Two collaborations at the Tevatron have combined data from their searches for the Higgs boson and report evidence of a new particle decaying into heavy quark pairs. This could be the first experimental evidence that the same mechanism that gives mass to the carriers of the weak force also underlies the mass of quarks. Soon the LHC experiments will release data with greater sensitivity in this decay channel, which will give us a fuller understanding of how the Higgs field couples to fundamental particles. TECHNICAL ARTICLE

Tags: Materials science, Advanced materials

A new idea in the development of next-generation memory devices

Nanowerk, 10AUG2012

Researchers have discovered that magnetic and dielectric properties can be largely controlled by substituting other atoms for the nonmagnetic atoms in a magnetic material. Using the ultra-high pressure synthesis device, the team succeeded in synthesizing a high quality AgFeO2 specimen in which Ag ions are completely substituted for the nonmagnetic Cu ions in the delafossite oxide CuFeO2, and clarified the fact that the new material displays ferroelectric polarization in an environment without a magnetic field.

Tags: Materials science, Microelectronics

MICROELECTRONICS

Atomic-scale insights advance research on germanium-based electronics

Nanowerk Spotlight, 14AUG2012

Researchers have now demonstrated a method to densely pack dopant molecules on the germanium surface, which then self-organize to form molecular patterns with one phosphorus dopant atom every two germanium atoms. The key finding is that when you deposit phosphine molecules on a germanium surface, they naturally form molecular patterns with one phosphorus atom every two germanium atoms that densely pack the surface. TECHNICAL ARTICLE

Tags: Microelectronics, Semiconductors

SEMATECH achieves world-class defect reductions in EUV mask blanks to enable high-volume manufacturing

Nanowerk, 14AUG2012

Following a two-year effort to improve deposition tool hardware, process parameters and substrate cleaning techniques, technologists deposited EUV multilayers with as few as eight defects per mask at 50 nm sensitivity (SiO2 equivalent), which includes 6 substrate defects, one handling defect and one defect from the multi-layer deposition process. This result was achieved on a 40 bi-layer film stack with an Ru cap and measured over the mask blank quality area of 132 x 132 mm2.

Tags: Microelectronics, Semiconductors

NEUROSCIENCE

Simple mathematical computations underlie brain circuits

MIT News, 08AUG2012

Deciphering complex circuits is critical to understanding how the brain works and what goes wrong in neurological

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disorders. MIT neuroscientists have now taken a major step toward that goal. They report that two major classes of brain cells repress neural activity in specific mathematical ways: One type subtracts from overall activation, while the other divides it.
Tags: Neuroscience

QUANTUM SCIENCE

Speedy ions could add zip to quantum computers

Science Daily, 14AUG2012

Physicists at NIST can accelerate their beryllium ions from zero to 100 miles per hour and stop them in just a few microseconds. The researchers think their zippy ions may be useful in future quantum computers.
Tags: Quantum science, S&T USA

IBM Scientists "Waltz" Closer to Using Spintronics in Computing

IBM, 13AUG2012

Aiming to use electron spins for storing, transporting and processing information, researchers from IBM and scientists at ETH Zurich revealed the first-ever direct mapping of the formation of a persistent spin helix in a semiconductor. TECHNICAL ARTICLE
Tags: Quantum science

Quantum cryptography theory has a demonstrated security defect

Science Daily, 13AUG2012

Researchers at Tamagawa University, Japan, announced August 10 that they had demonstrated the incompleteness and limit of the security theory in quantum key distribution. The present theory cannot guarantee unconditional security. Details will be given at the SPIE conference on Quantum Communication and Quantum Imaging on August 15, 2012.
Tags: Quantum science, S&T Japan

Quantum teleportation achieved over record distances

Nature News, 13AUG2012

Two teams of researchers have extended the reach of quantum teleportation to unprecedented lengths, roughly equivalent to the distance between New York City and Philadelphia. The secure method of speedy communication of information could lead to space-based transmission.
Tags: Quantum science

SCIENCE WITHOUT BORDERS

Independent labs to verify high-profile papers

Nature News, 14AUG2012

Scientific publishers are backing an initiative to encourage authors of high-profile research papers to get their results replicated by independent labs. Validation studies will earn authors a certificate and a second publication, and will save other researchers from basing their work on faulty results.
Tags: Science without borders

SENSORS

New photoacoustic technique detects multiple nerve agents simultaneously

Nanowerk, 14AUG2012

Laser photoacoustic spectroscopy (LPAS) can identify only one chemical at a time. Researchers at the Army Research Laboratory realized that multiple LPAS absorption measurements—representing an 'absorption spectrum'—might provide the added information required in any detection and identification scheme. To create such a multi-wavelength LPAS system they designed a sensor known as a photoacoustic cell. This hollow, cylindrical device holds the gas being sampled and contains microphones that can listen for the characteristic signal when light is applied to the sample. TECHNICAL ARTICLE
Tags: Sensors, Counter WMD ■

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